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HOW TO DETERMINE SEASONING DEGRADE LOSSES IN SAWMILL LUMBERYARDS

Sawmill operators generally recognize the problem of defects due to air-drying hardwood lumber, but they often fail to realize how much these seasoning losses cost in money, time, and wasted lumber.

A recent study revealed that degrade losses in the air-drying of red oak averaged more than $10 per 1,000 board feet in the central Appalachian region.[1] This figure included only the decrease in lumber value due to reductions in grade from seasoning defects. The cost of rehandling or remanufacturing the degraded boards would have represented an additional loss that was not calculated in the study.

Yet seasoning degrade losses of less than $2 per 1,000 feet were found at more than half the mills sampled, which indicated that most seasoning degrade can be eliminated. A dollar saved in degrade losses is at least as beneficial to the lumber producer as a dollar increase in lumber prices.

The results of this study indicate the need for sawmill operators to determine the degrade losses in their operations. Such information would be useful in determining what improvements in lumber-drying practices are necessary to reduce losses to acceptable levels.

A method by which the individual operator can make periodic determinations of air-seasoning degrade losses is suggested here. The procedure is inexpensive because the necessary information can be obtained by the lumber inspector during normal grading operations and does not require extra men or equipment. The system has been tested at a number of Appalachian sawmills with excellent results.

[1] Results of an unpublished study involving a random sample of 329,000 board feet. Data on file at the Forest Products Marketing Laboratory, Princeton, West Virginia.

Procedure

Seasoning degrade is determined at the time air-dry lumber is being prepared for shipment. The procedure is not difficult: it can be applied by any competent hardwood lumber inspector without seriously interrupting normal grading operations.

Care should be taken to distinguish between seasoning defects and other types of defects. For example, a shake that becomes evident after air-drying should not be counted as a seasoning defect; neither should defects resulting from logging damage, insect damage, and milling or handling.

But splits, checks, warp, and stain (except mineral stain) are all seasoning defects. The diagrams below (fig. 1) illustrate how seasoning defects can lower the grade and value of lumber.

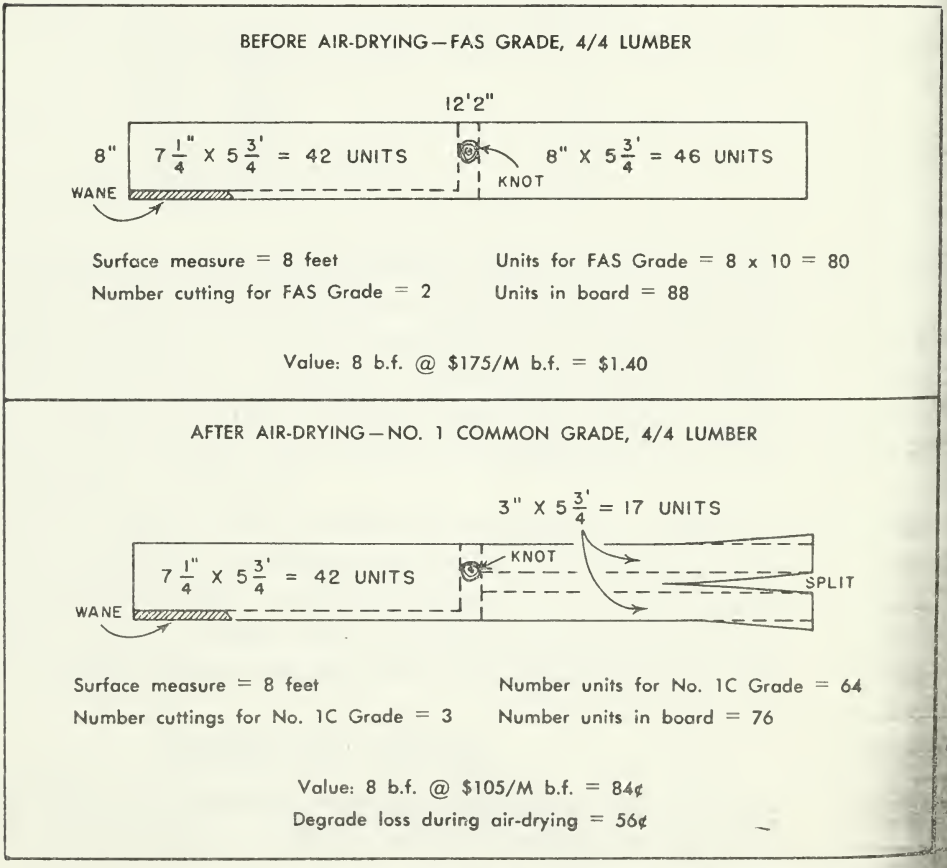

Figure 1.—How seasoning defects can lower the grade and value of lumber.

Although it is often possible to improve a degraded board by ripping or trimming, no allowance should be made for this in the degrade determination. Each board should be evaluated in its present condition, and not in its potential remanufactured condition.

Selection of Sample

Each mill manager should first determine how much lumber he needs to sample to obtain a reliable estimate of air-drying losses. A 5-percent sample of shipments by species is usually adequate for evaluating the drying practices at large operations, provided the samples are selected at random and represent lumber piled for seasoning over the entire year. On the other hand, 30 percent of all lumber shipped should be checked on very small operations. The following tabulation provides suggested sampling levels for yards of different sizes.

Yard size: Volume shipped per year (M bd. ft.)	*Sample size, by species (percent)*
5,000 and over	5
2,500 — 4,999	10
1,500 — 2,499	15
750 — 1,499	20
500 — 749	25
Up to 499	30

Special checks are often needed to determine the amount of seasoning degrade that is occurring in sections of air-drying yards that have recently been modified; additional checks are beneficial for determining needed improvements for sections of yards that consistently show more degrade than others. In any event, tests for degrade should be frequent enough to provide the mill manager with up-to-date knowledge of the lumber drying performance of his yard.

Normally, the sample should include all the lumber in a particular shipment. This simplifies the sampling procedure, as the shipping tally sheet then becomes the basis for figuring degrade loss per 1,000 board feet. Degrade loss for a single stack of lumber can be determined, if desired, by recording separate shipping tallies and degrade data for each stack.

Grading and Tallying

The technique for determining degrade is essentially that of dual-grading the air-dry boards, a research method developed by the U.S.

Forest Products Laboratory. This method eliminates the need for grading the green lumber and then regrading it when dry to determine grade losses. The procedure is as follows:

1. Determine the present grade of each air-dry board and tally it in the usual manner on the lumber shipping tally sheet.
2. Determine whether the board contains seasoning defects, and if so, whether the present grade of the board is lower than it would have been if the seasoning defects were not present.
3. If the board has been degraded one or more grades by seasoning defects, record the degrade information on the Degrade Tally Sheet as follows:

DEGRADE TALLY SHEET

Original green grade[2]	*Air-dry grade*[3]	*Volume (bd. ft.)*[4]	*Type defect*[5]
FAS	No. 1C	8	Split
FAS	No. 2C	9	Check
No. 1C	No. 2C	6	Warp
No. 1C	No. 3AC	5	Stain

[2] The estimated green grade of the degraded board at the time of stacking for air-seasoning.
[3] The actual air-dry grade of the degraded board when inspected at time of shipping.
[4] The air-dry volume of the degraded board.
[5] The major seasoning defect responsible for degrading the board.

Calculation of Degrade Losses

After dual-grading of a shipment of lumber, the information on all the tally sheets should be summarized to determine the following:

1. The total volume of lumber in the shipment.
2. The volume of lumber degraded in each grade change category. For example, from FAS to No. 1C; from No. 1C to No. 2C; from FAS 1FC to No. 2C, etc.

This information is then combined with lumber values by grades to prepare the degrade loss summary, as in the following example:

DEGRADE LOSS SUMMARY

Potential grade & value/M bd. ft.	*Actual grade & value/M bd. ft.*	*Value difference M bd. ft.*	*Volume degraded (bd. ft.)*	*Degrade loss*
(1) FAS ($175)	No. 1C ($105)	$ 70	80	$ 5.60
(2) FAS ($175)	No. 2C ($68)	107	180	19.26
(3) No. 1C ($105)	No. 2C ($68)	37	80	2.96
			Total degrade loss =	$27.82
			Total volume graded, bd. ft. =	4,125
			Average degrade loss/M bd. ft. =	$ 6.74

This example indicates (1) that 80 board feet were degraded from FAS to No. 1 Common; (2) that 180 board feet were degraded from FAS to No. 2 Common; and (3) that 80 board feet were degraded from No. 1 Common and No. 2 Common.

The volumes in each grade change category are multiplied by the appropriate value differences per 1,000 board feet to obtain the total loss for each category. The average degrade loss is based on the total volume in the shipment. In the above example, a total degrade loss of $27.82 occurred in a shipment that contained 4,125 board feet, which meant an average seasoning degrade loss of $6.74 per 1,000 board feet ($27.82 divided by 4.125).

Evaluating Causes of Degrade

A summary of the volume of lumber degraded by each major type of seasoning defect can be helpful in determining the nature of improvements needed in the air-drying yard. This data should be taken from the degrade-tally sheets and recorded on the following form:

VOLUME DEGRADED, BY TYPE OF DEFECT

Sample number	*Split (bd. ft.)*	*Check (bd. ft.)*	*Warp (bd. ft.)*	*Stain (bd. ft.)*
1	120	180	30	30
2	100	130	27	20

In this example, the large proportion of degrade loss was due to splits and checks, while only minor degrade resulted from warp and stain. This indicates that the lumber dried rapidly, but that it was not protected sufficiently from the weather.

Research studies conducted at Appalachian hardwood sawmill lumberyards show that the lack of proper lumber-stack roofing is the major cause for surface checking; and that too few stickers in the stacks is the major cause for splitting. Poor sticker alignment and poor bunk alignment are the major causes of warp (cup, crook, bow, and twist), although the lack of roofing also causes warp in the top layers of lumber in the stacks.

Stain was not found to be a major degrade problem in drying red oak, although some cases of sticker stain were found where drying conditions were poor and where wide, green stickers were used.

In their approximate order of importance, the principal causes of the

four types of seasoning degrade found at the sawmill lumberyards are listed below:

Split

1. Too few stickers.
2. Lack of roofing or poor roofing.
3. Stickers not flush with ends of boards.

Check

1. Lack of roofing.
2. Board edges exposed at bunk spaces.
3. Stickers not flush with ends of boards.
4. Too rapid drying due to excessive exposure of lumber stacks.

Warp

1. Poor sticker alignment.
2. Poor bunk alignment.
3. Lack of sufficient stickers.
4. Foundation out of level.
5. Thick and thin lumber in same course in stack.

Stain

1. No chemical dip.
2. Use of green stickers.
3. Use of wide stickers.
4. Base of piles too low.
5. Grass and weeds growing between stacks.
6. Poor yard orientation or location.

Unavoidable Degrade Losses

A certain amount of seasoning degrade is unavoidable in drying lumber in open yards. Research investigations have not determined the precise allowable degrade losses by species and thicknesses of lumber. However, rough guidelines can be established for the major hardwood species in the Appalachian region. In general, air-drying practices should be improved if degrade tests at the lumberyard show consistently greater losses than indicated in the following:

Species	*Thickness*	*Allowable losses in percent of air-dry lumber value*
White and red oak	4/4 and 5/4	1.0
White and red oak	6/4 and 8/4	2.0
Poplar, basswood, and cucumber	4/4 and 5/4	.5
Poplar, basswood, and cucumber	6/4 and 8/4	1.0
Maple and beech	4/4 and 5/4	2.0
Maple and beech	6/4 and 8/4	3.0

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